

# PATENT ABSTRACTS OF JAPAN

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## (54) APPARATUS FOR SEMICONDUCTOR DEVICE MANUFACTURE

(57)Abstract:

PURPOSE: To prevent the deterioration of removing apparatus service life caused by conventional one system for flowing a plurality of gases and reduce the work steps by providing a sensor to discriminate the kinds of exhaust gases and their concentrations and automatically changing the system to an exhaust gas system according to the judgment.

CONSTITUTION: An  $\text{SiH}_4$  gas is introduced through a gas inlet 2 of an reaction chamber 1, where a semiconductor substrate has been placed in advance for depressurization gaseous phase growth. The exhaust gas is ventilated through a pump 3, and at that time, a sensor 4 for chlorine gas measures the chlorine concentration and the gas flow is controlled by a valve control system 7 so as to open a valve 6 on an  $\text{SiH}_4$  removing apparatus 5 side when the measured value is lower than the reference value. On the other hand, when the chamber 1 is subject to cleaning by using a  $\text{ClF}_3$  gas, the chlorine

concentration in the exhaust gas increases, and when it reaches a specified threshold value, a valve 9 on a  $\text{ClF}_3$  removing apparatus 8 side will be opened via a command of the system 7 and the valve 6 on the apparatus 5 side be also closed at the same time. Thus, the apparatus 8 can be kept free of clogging for 3 months.

## CLAIMS

[Claim(s)]

[Claim 1] In a manufacturing installation of a semiconductor device which has an exhaust system and needs to switch an exhaust system according to a kind and concentration of gas to exhaust, A manufacturing installation of a semiconductor device having a sensor which identifies a kind, concentration, etc. of exhaust gas, and switching to an exhaust system

corresponding to it automatically using information from this sensor.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the manufacturing installation of a semiconductor device which has an exhaust system of the gas to exhaust with respect to the manufacturing installation of a semiconductor device.

[0002]

[Description of the Prior Art] The exhaust system of the manufacturing installation of the conventional semiconductor device had many which are not switched according to the kind of gas to exhaust, for example, when growing up polysilicon with LPCVD equipment, the exhaust system was exhausted through the eliminating unit of  $\text{SiH}_4$  (mono silane) by one. About the thing of specification which passes  $\text{ClF}_3$  gas with a same system for cleaning of a reaction chamber, the  $\text{ClF}_3$  eliminating unit and the  $\text{SiH}_4$  eliminating unit were connected in series, and it was exhausting through both. When  $\text{SiH}_4$  was passed as another technique and a  $\text{SiH}_4$  eliminating unit and  $\text{ClF}_3$  were passed, the method of switching and passing a valve with a  $\text{ClF}_3$  eliminating unit and hand control was also taken.

[0003]

[Problem to be solved by the invention] When taking for an example the LPCVD equipment which performs this conventional polysilicon growth and passing  $\text{ClF}_3$  gas with a same system for cleaning of a reaction chamber, a  $\text{ClF}_3$  eliminating unit and a  $\text{SiH}_4$  eliminating unit are connected in series. Since  $\text{SiH}_4$  gas will be eliminated through a  $\text{ClF}_3$  eliminating unit if  $\text{SiH}_4$  gas is passed here, the  $\text{ClF}_3$  eliminating unit with which the damage elimination method is different will be got blocked for  $\text{SiH}_4$  gas, and it will become quite briefer than the life to expect. When it has composition which pours the back  $\text{ClF}_3$  gas eliminating unit of the eliminating unit of  $\text{SiH}_4$  gas, when  $\text{ClF}_3$  gas is passed,  $\text{HCl}$  occurs within a  $\text{SiH}_4$  gas eliminating unit, a  $\text{SiH}_4$  eliminating unit corrodes, and it is \*\*\*\*\* in brief [ slight ] about a life too. When arranging a  $\text{ClF}_3$  eliminating unit and a  $\text{SiH}_4$  eliminating unit in parallel and passing  $\text{ClF}_3$  gas manually, the exhaust air to a  $\text{ClF}_3$  eliminating unit, It is  $\text{SiH}_4$  when passing  $\text{SiH}_4$  gas. Switching with the exhaust air to an eliminating unit required the man day, and there was a problem of being easy to start a work error.

[0004]

[Means for solving problem] The exhaust system of the manufacturing installation of the semiconductor device of this invention is provided with the sensor which has two or more exhaust systems in parallel and as for which a color exception carries out kind concentration of exhaust gas, and has a function which can be automatically switched to the exhaust system corresponding to it using the information from the sensor.

[0005]

[Working example] Next, this invention is explained with reference to Drawings.

[0006] Drawing 1 is a schematic view showing the manufacturing installation of the semiconductor device of the 1st working example of this invention. Although this example is

LPCVD equipment, as long as it is an exhaust system attached to the manufacturing installation of a semiconductor device, an exhaust system can be separated temporarily and only the exhaust system may serve as another unit. It is put into a semiconductor substrate in the reaction chamber 1, and decompression vapor growth of the  $\text{SiH}_4$  (mono silane) gas is introduced and carried out from the gas inlet 2. Although exhaust gas is pulled and is exhausted with the pump 3, in that case, the level of chlorine is measured by the sensor 4 for gaseous chlorine, and in below a certain reference value, it is controlled by valve control System 7 so that the valve 6 by the side of the  $\text{SiH}_4$  eliminating unit 5 opens.

[0007]On the other hand, when cleaning the reaction chamber 1 by  $\text{ClF}_3$  gas, if the level of chlorine in exhaust gas goes up gradually and becomes a certain threshold value, the bubble 9 by the side of the  $\text{ClF}_3$  eliminating unit 8 will open by instructions of bubble C-system 7, and the bubble 6 by the side of the  $\text{SiH}_4$  eliminating unit 5 will close simultaneously.

[0008]The  $\text{ClF}_3$  eliminating unit 8 worked normally conventionally, without getting it blocked to have been choked up in order that  $\text{SiH}_4$  gas might flow in about one month for about three months, as a result of carrying out this working example.

[0009]Drawing 2 is a schematic view showing the 2nd working example of this invention. Although the  $\text{SiH}_4$  eliminating unit 5 and the  $\text{ClF}_3$  eliminating unit 8 have been arranged in parallel in the 1st previous working example, the  $\text{SiH}_4$  eliminating unit 5 and the  $\text{ClF}_3$  eliminating unit 8 are arranged in series in this 2nd working example. If a reference value with the concentration of gaseous chlorine is exceeded by the sensor 4, the  $\text{SiH}_4$  eliminating unit side valve 6 will close, and the  $\text{ClF}_3$  eliminating unit side valve 9 will open, and it has structure which bypasses the  $\text{SiH}_4$  eliminating unit 5 and is direct exhausted by the  $\text{ClF}_3$  eliminating unit 8.

[0010]Since this 2nd working example can be made to exhaust through both the  $\text{SiH}_4$  eliminating unit 5 and the  $\text{ClF}_3$  eliminating unit 8 when the sensor 4 becomes poor, it is safe.

[0011]

[Effect of the Invention]As explained above, in this invention, it has a sensor as for which a color exception carries out a kind, concentration, etc. of exhaust gas, and it has a function automatically switched to the exhaust system corresponding to it.

Therefore, the fall of the life of the eliminating unit produced in order to pass the gas of former plurality by one line can be prevented.

Since this invention can be automatically switched although switched manually when two or more exhaust systems are given, a working man hour can be reduced and a work error is also lost. If the threshold value which has furthermore measured not only a kind but concentration by this sensor is exceeded and the system which switches a valve is constituted, the timing of the still more nearly optimal valve opening and closing can be obtained.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]It is a schematic view showing the 1st working example of this invention.

[Drawing 2]It is a schematic view showing the 2nd working example of this invention.

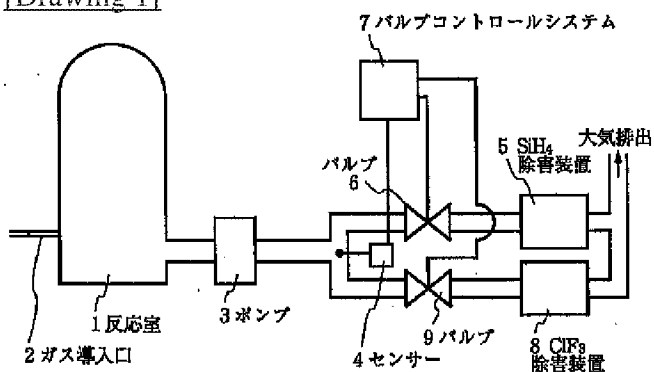
[Explanations of letters or numerals]

- 1 Reaction chamber
- 2 Gas inlet
- 3 Pump
- 4 Sensor
- 5 SiH<sub>4</sub> eliminating unit
- 6 valve (for SiH<sub>4</sub> eliminating unit introduction)
- 7 Valve control system
- 8 ClF<sub>3</sub> eliminating unit
- 9 valve (for ClF<sub>3</sub> eliminating unit introduction)

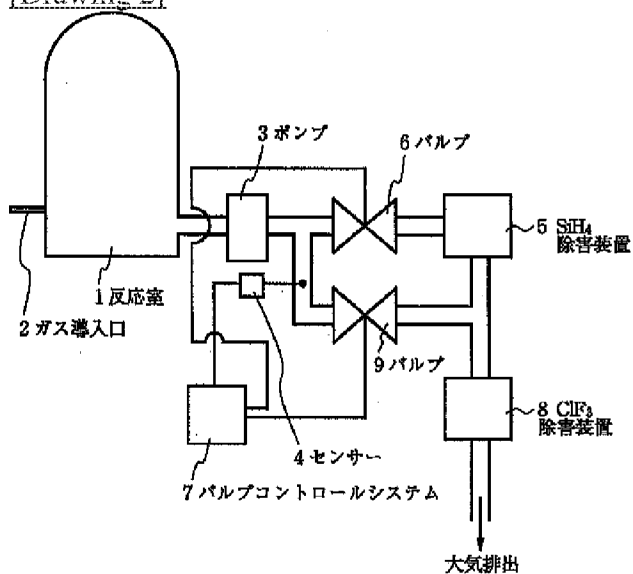
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## DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]